

**UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF TEXAS
TYLER DIVISION**

BLUE SPIKE, LLC,
Plaintiff,

V.

TEXAS INSTRUMENTS, INC.

Defendants.

BLUE SPIKE, LLC,
Plaintiff,

V.

AUDIBLE MAGIC CORPORATION,
ET AL.

Defendants.

Civil Action No. 6:12-CV-499-MHS-CMC

(LEAD CASE)

JURY TRIAL DEMANDED

Civil Action No. 6:12-CV-576-MHS-CMC

(CONSOLIDATED WITH 6:12-CV-499)

JURY TRIAL DEMANDED

EXPERT DECLARATION OF JOHN SNELL

I, John Snell, declare as follows:

1. I have personal knowledge of the facts and opinions stated below. In the event I am requested to testify on these facts and opinions, I could do so competently.

2. Defendants asked me to provide opinions regarding the definiteness of certain claim terms of U.S. Patent Nos. 7,346,472 (“the ’472 patent”), 7,660,700 (“the ’700 patent”), 7,949,494 (“the ’494 patent”), and 8,214,175 (“the ’175 patent”), the “patents-in-suit.”

3. I understand that Defendants may request additional opinions on the invalidity of the patents-in-suit, among other topics. I understand that discovery is continuing in this case and that Defendants may ask me to render different opinions based on additional information that

may be made available in the future, or orders of this Court. As a result, I reserve the right to amend or supplement my opinions in light of evidence presented by Plaintiff in light of additional information, and in light of the fact that discovery is continuing, the claims have yet to be construed by the Court, and that expert disclosures have yet to occur.

QUALIFICATIONS

4. I am an engineer, specializing in the design and analysis of microelectronics, software, and systems. I have over four decades of experience in electronics engineering, computer science, signal processing mathematics, and the engineering of audio, video, graphics and music systems connected by networks. I have researched, designed, developed and analyzed the microelectronics and software of numerous systems. A complete copy of my CV is attached hereto as Exhibit A.

5. My interdisciplinary graduate work through the electrical engineering department at Carnegie-Mellon University was performed with a grant from the National Science Foundation. I earned my Bachelor of Science degree in Electrical Engineering and my Bachelor of Arts degree in Cybernetics (a related interdisciplinary program, combining coursework in computer science, signal processing mathematics, physics, music analysis and composition, psychology and physiology of perception as well as audio, video and electrical engineering), both at Carnegie-Mellon University.

6. I wrote my first computer program in 1968 on a mainframe computer at Carnegie-Mellon University, where I studied courses in programming, including data structures and software design for real-time systems. I have programmed computers and media processing digital systems at all levels, from high-level software down to assembly language and microcode.

7. I worked on the development of a large multiprocessing computer system and a graphics display processor, as well as analog-to-digital and digital-to-analog audio converters in the Engineering Lab of the Artificial Intelligence Lab at Carnegie-Mellon University in the early 1970s. I designed and wrote music and audio signal processing software in the early 1970s for the Digital Equipment Corp. PDP-10, PDP-15, and PDP-11 computers in the early 1970s. I co-designed the microelectronics and software of a real-time microwave (wireless) signal analyzer in the mid-1970s.

8. I am the founder (1976) and original editor of the COMPUTER MUSIC JOURNAL, an academic publication of international research on the application of computer science, signal processing mathematics, electronics, software, physics, acoustics and psychology of perception to the composition, recording, editing, and processing of music. Several books have been published based on articles that I collected and edited.¹

9. I also did research in digital audio and music processing at Stanford University from 1977 to 1980 at the Center for Computer Research in Music and Acoustics (CCRMA). I studied analysis of music signals at CCRMA and edited articles on analysis of music signals for the Computer Music Journal during this period. I worked on the development of the third generation of Stanford's CCRMA mainframe computer for editing and signal processing of music, and our computer was connected to the ARPANET at the Stanford Artificial Intelligence Lab.

¹ I edited and organized the articles with C. Roads and J. Strawn for a multi-volume publication which was subsequently published as several books entitled: Digital Audio Engineering, 1985 Kaufmann, Inc., Foundations of Computer Music, 1985 MIT Press, and Digital Audio Signal Processing, 1985 Kaufmann, Inc.

10. I was a design engineer from 1980 to 1986 at Lucasfilm Ltd., where we designed and developed the microelectronics and software of graphics-based multiprocessor supercomputers for recording, processing, synthesis, editing and transferring of digital music, voices, Foley, and sound effects. In addition to design of the programmable digital mixing console and solid state memory system of our Digital Audio Signal Processor (a.k.a. ASP and SoundDroid), I contributed to the architecture and use of higher-speed circuitry (change from noisy, slower TTL to faster, less noise-prone, ECL supercomputer integrated circuitry) for real-time operation. Our ASP/SoundDroid system included static and dynamic random access semiconductor memory (RAM) as well as disk drives for storing digital audio. This multiprocessor system was designed so that multiple channels of digital audio could be processed and transmitted over a private Ethernet. Our Trio project was designed for editing digital audio and video with optical video disks.

11. I designed several real-time multiprocessing systems for processing digital media signals over the last few decades and wrote a book, which detailed my design of numerous architectures for processing audio and video.² In 1989, I was invited to give an international presentation on real-time software design issues in programming multiprocessor systems, which was subsequently published by the Audio Engineering Society.³ My article on interactive multiprocessor digital signal processing, presented at the IEEE ASSP Workshop on Applications of Signal Processing to Audio and Acoustics in Mohonk, NY was published by the IEEE.⁴ I

² Snell, John, *Multiprocessor Architectures and Design Techniques for Media Signal Processing and Synthesis*, Timbre Engineering (1995).

³ Snell, John, *Multiprocessor DSP Architectures and Implications for Software*, Audio in Digital Times, Audio Engineering Society (1989).

⁴ Snell, John, *Expandable Interactive Real-time Multiprocessor DSP*, Applications of Signal Processors to Audio and Acoustics, IEEE (1989).

compared signal processing on RISC architecture to DSP architecture in a 1992 article.⁵ In the 1990s, I worked on the design of a supercomputer chip and algorithms for personal home computers, which enabled simultaneous processing of multiple streams of media. This integrated circuit with its software was designed to receive, decode and process digital video, digital audio and graphics while implementing modem algorithms for connection to the Internet. Perceptually based software was used to compress and decompress media files. In the 1990s, I also worked on AC3 digital audio compression for Dolby Labs. For the Advanced Research division of Sony Corporation in Tokyo, I co-designed a professional workstation for processing very-high fidelity multitrack DSD music, recording at video sample rates in the late 1990s. Common practice had been to write real-time signal processing applications in assembly language for speed; however, I designed this multiprocessor so that real-time signal processing could be programmed in a more easily programmable, higher-level language. I wrote software in C and C++ for this 4-year project for Sony Electronics through 2000.

12. Over the last decade, I worked on the design of a multiprocessing supercomputer system which allowed customers to select their own movies and music over the Internet and have them transmitted from solid state memory to their home over the higher-fidelity cable TV and satellite dish (wireless) networks, including thousands of channels of high-fidelity digital audio and high-definition digital video. I also worked on the design/analysis of smartphone applications involving digital media. I have used the Internet and its predecessor, the ARPANET, since 1972 for my research and development work in digital media. I have given lectures and engineering presentations at international conferences, research centers and universities.

⁵ Snell, John, *RISC vs DSP in Embedded Applications*, Computer Design (Apr. 1992).

13. I have given lectures and engineering presentations at Audio Engineering Society international conferences, International Computer Music Conferences, Institute of Electrical and Electronics Engineers (IEEE) International Conference on Signal Processing Applications and Technology, Stanford University, Institut de Recherche et Coordination Acoustique/Musique (IRCAM, Paris), University of California, Microprocessor Forum, Eastman School of Music, Northwestern University, DSPx (Digital Signal Processing Conference, San Jose, CA), IEEE Mini/Micro West (San Francisco), WCCF, Mills College and Carnegie-Mellon University.

14. My experience with media is not limited to microelectronics and software engineering. I have been a musician since early childhood, and my compositions have been played in concerts and over the radio, as well as in live theater and movie soundtracks. My photography has been selected for publication in calendars.

15. I served from 1992 to 1995 on the Editorial Review Board of MICROPROCESSOR REPORT. I analyzed the internal design of state-of-the-art digital media processing chips and advanced memory technology for this highly-respected publication on integrated circuit design for electrical engineers and computer scientists.

16. I was honored by the Audio Engineering Society in 2000 with a Fellowship Award for innovative digital audio engineering design and valuable contributions to the advancement of audio engineering.

17. I have analyzed hundreds of patents since the early 1970s and have served as an expert witness in trial and deposition. I am being compensated at \$400/hour for my work on this case.

MATERIALS CONSIDERED

18. I considered the following in forming the opinions set forth in this declaration: U.S. Patent Nos. 7,346,472, 7,660,700, 7,949,494, and 8,214,175, their file histories, Plaintiff Blue Spike, LLC's Patent Local Rule 3-1 Infringement Contentions, the parties' Patent Local Rule 4-3 Supplemental Joint Claim Construction and Prehearing Statement and Joint Claim Construction Chart, and Blue Spike's Opening Claim Construction Brief.

LEGAL STANDARDS

19. I have been informed about certain legal standards applicable to the statutory requirements for a patent claim. It is my understanding that, to be valid, each claim of a patent must particularly point out and distinctly claim the subject matter which the inventor or a joint inventor regards as the invention. Indefiniteness, like claim construction, is a question of law to be decided by the Court. But it is based on underlying factual findings, such as the knowledge and understanding of a person of ordinary skill in the art.

20. I understand that the statutory requirement of "definiteness" is met only when claims clearly distinguish what is claimed from what went before in the art and clearly circumscribe what is foreclosed from future enterprise. Thus, I understand that a claim is indefinite if its claims, read in light of the patent's specification and prosecution history, fail to inform, with reasonable certainty, one skilled in the art about the scope of the invention. Finally, I understand that an issued patent is entitled to a presumption of validity and that indefiniteness must be shown by clear and convincing evidence.

21. In addition, I understand that the scope of claim language cannot depend solely on the unrestrained, subjective opinion of a particular individual purportedly practicing the invention. A patent must provide some objective standard in order to allow the public to

determine the scope of the claimed invention.

22. I have also been informed about the standards relating to the construction of the terms of a claim. I understand that the construction of a term is a question of law to be decided by the Court.

23. I understand that the starting point for any claim construction must be the claims themselves. In addition, absent a disclaimer or an instance in which the patentee has acted as a lexicographer, I understand that claim language is generally given the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention.

24. In addition to the language of the claims, I understand that the specification of the patent is highly relevant to claim construction and is often the single best guide to the meaning of a disputed term. Indeed, I understand that the language of the specification can narrow the meaning of a claim term. For example, I understand that when the specification makes clear that the invention does not include a particular feature, that feature is deemed to be outside the reach of the claims of the patent, even though the language of the claims, read without reference to the specification, might be considered broad enough to encompass the feature in question.

LEVEL OF ORDINARY SKILL IN THE ART

25. I am informed that certain factors may be considered in determining the level of ordinary skill in the art at the time of the invention: (1) the type of problems encountered in the art; (2) prior art solutions to these problems; (3) the rapidity with which inventions are made; (4) the sophistication of the technology; and (5) the educational level of active workers in the field. I am also informed that a person of ordinary skill in the art is also a person of ordinary creativity, not an automaton.

26. Based on my knowledge and experience, it is my opinion that a person of ordinary skill in the art relevant to the patents-in-suit at the time of their purported invention (*i.e.* at least by September 7, 2000, which I understand Blue Spike claims is the priority date of the patents-in-suit) would have been a person with at least a Bachelor's degree in Electrical Engineering, Computer Science or an equivalent degree, with at least two years of signal or image processing experience.

27. At least by 2000, I would have qualified as a person of ordinary skill in the art. At Carnegie-Mellon University, I received a BA in Cybernetics in 1972, and received my Bachelor of Science degree in Electrical Engineering in 1974. My interdisciplinary graduate work through the electrical engineering department at Carnegie-Mellon University was performed with a grant from the National Science Foundation. I was a guest researcher at the Center for Computer Research in Music and Acoustics at Stanford University from 1978 to 1980 and refined my digital signal processing skills in a mathematics class at Stanford in 1992.

28. I understand that Blue Spike has alleged that the level of ordinary skill in the art is a person with a Master's degree in computer science or computer engineering, or equivalent experience, as well as two years' experience in the field of digital fingerprinting and cryptography. While I do not agree with this conclusion, my analyses below would remain unchanged.

THE PATENTS-IN-SUIT

29. I understand that the four patents-in-suit relate to signal processing technology and are part of the same patent family and share a common specification. These patents generally describe a system and method for monitoring, analyzing and comparing signals. An idea of data reduction in audio and visual media, while preserving perceptual quality of the data-

reduced signals, is presented in these patents to identify and find similar media through efficient comparison of such data-reduced signals. Design of systems and methods that function as claimed in the patents depend on a skillful *combination* of knowledge in electrical engineering, signal processing mathematics, computer science and efficient programming, and the physics of musical instruments, the vocal tract, and sound, as well as the acoustics of concert halls or studios in which music is recorded, human physiology and psychology of perception of music, physics of light, photography and moving pictures, music theory, and the composition of art, photography and movies.

30. To help understand the task of identifying and comparing media, a few aspects of musical analysis will be considered. Although the first step in analyzing physical signals involves signal processing mathematics, an understanding of rhythm, harmony and counterpoint is important in identification of music to determine perceptually similar music. Musicians, music instruments and musical styles from different parts of the world are used in jazz, movie sound tracks, and pop music. Analysis software often fails to identify rhythms based on African polyrhythms and the complex rhythms of Eastern Europe⁶ used in some contemporary music. Although simple major and minor modes of Western music are often understood, few people of ordinary skill in the art understand the tuning systems and modes from other parts of the world, which have found their way into contemporary music. Analysis software written by musically-naïve computer scientists often fails to accurately recognize the tuning (pitches) of music played in parts of the world which do not use the western equal-tempered tuning system (e.g., Balinese and Javanese gamelan, Makam in the Middle East, Eastern Europe, North Africa and Arabic

⁶ For example, a 7 beat rhythm composed of playing a note for 3/7 second followed by two notes of 2/7 second each.

countries, and Indian raga). The patent fails to describe how music theory and ethnomusicology would be used to analyze, identify and compare contemporary music.

31. The patents-in-suit mention the identification and comparison of recordings of the same song sung by different singers. When different singers sing the same score with different instruments in perceptually similar recordings, the recorded signals are very different. An understanding of the physics of each music instrument and vocal tract is needed to separate simultaneously sung and played notes into some form of musical score with different parts for each instrument and voice. Also required is an understanding of the dynamically changing harmonic and inharmonic spectra of the many music instruments and voices used in recordings. Relatively few computer scientists, engineers, and mathematicians are familiar with the physics of the wide variety of music instruments used in contemporary music.⁷ A database must be developed, storing the signal characteristics of notes played on each instrument, at different pitches and loudness dynamics, as the spectral characteristics vary widely for some instruments over their dynamic range and pitch range.

32. One of ordinary skill in the art would depend on system block diagrams, algorithm flow charts, electronics schematics, mathematical equations, and software programs to understand and communicate systems and methods. The four patents-in-suit claim systems and

⁷ Music analysis, identification and comparison software involves the physics of western instruments, including acoustic and electric guitars, violin, snare drum, cello, bass drum, saxophone, piano, acoustic double bass and electric bass guitar, clarinet, banjo, oboe, mandolin, floor tom, trumpet, hi-hat, bassoon, hammered dulcimer, flute, French horn, bagpipe, viola, timpani, cymbals (crash, ride, splash, China and orchestral cymbals), piccolo, trombone, tuba, triangle, tambourine, xylophone, wood block, tubular bells, organ, synthesizers and samplers. Music analysis also involves identification and comparison of non-western instruments used in contemporary music, including conga drums, sitar, oud, doumbek, didgeridoo, panpipes, sarod, bandoneon, duduk, shanai, zurna, shakuhachi, gaida, marimba, bouzouki, tamburica, ukulele, veena, santur, cimbalom, doira, koto, balalaika and mbira.

methods of an idea without providing the necessary invention details. Without the software and system diagrams, one of ordinary skill in the art in 2000 would be dependent on block diagrams, algorithm flow charts, electronics schematics, the mathematical equations and database of reference signals (or data-reduced signals) for implementation of the claimed systems and methods. No system block diagrams, no algorithm flow charts, no electronics schematics, no mathematical equations, no software programs and no reference database were provided in these four patents. These four patents propose an idea, but offer inadequate means for implementation. The patents-in-suit claim to have invented a solution to a complex problem without providing guidance to one of ordinary skill in the art as to how to implement this invention. Critical nomenclature is abstract, vague and indefinite, often without providing essential detail for implementation.

CLAIM TERMS

33. As described in the Abstract of the patents-in-suit, the claimed invention is a “method and system for monitoring and analyzing at least one signal.” ’472, ’700, ’494, and ’175 patents at Abstract. The Abstract describes the invention as: “An abstract of at least one reference signal is generated and stored in a reference database. An abstract of a query signal to be analyzed is then generated so that the abstract of the query signal can be compared to the abstracts stored in the reference database for a match.” *Id.*

“abstract”

34. The term “abstract” appears in every asserted claim of the patents-in-suit.

35. Representative claim 3 of the ’472 patent reads:

A method for monitoring and analyzing at least one signal comprising: receiving at least one reference signal to be monitored; creating an *abstract* of said at least one reference signal in a

reference database; receiving at least one query signal to be analyzed; creating an *abstract* of said at least one query signal; comparing the *abstract* of said at least one query signal to the *abstract* of said at least one reference signal to determine if the *abstract* of said at least one query signal matches the *abstract* of said at least one reference signal

36. The term “abstract” has no specific meaning in the art. Considering the patents’ lack of software or specific description of how the term might vary between claims, one of ordinary skill in the art as of the time of the patents’ filing would not know how to interpret the term “abstract.”

37. I have studied the common specification of the patents-in-suit to determine whether it informs one of ordinary skill what the term “abstract” means. The specification describes steps for generating an abstract: “1) analyze the characteristics of each signal in a group of audible/perceptible variations for the same signal (e.g., analyze each of five versions of the same song—which versions may have the same lyrics and music but which are sung by different artists); and 2) select those characteristics which achieve remain relatively constant (or in other words, which have minimum variation) for each of the signals in the group.” ’472 patent at 3:63–67; 4:1–4. The specification also describes “the present invention . . . as ‘computer-acoustic’ and ‘computer-visual’ modeling, where the signal abstracts are created using data reduction techniques to determine the smallest amount of data, at least a single bit, which can represent and differentiate two digitized signal representations for a given predefined signal set.” *Id.* at 10:9–16. Nowhere else does the specification attempt to define the term “abstract” or how one is generated.

38. These attempts to describe the term “abstract” in the specification of the patents-in-suit do not inform one of ordinary skill what an “abstract” means in the context of the patents-in-suit.

39. The Opening Claim Construction Brief of Blue Spike, LLC stated that “both independent and dependent claims alter the definition of this term, making a single definition impossible to achieve.” Blue Spike Opening Claim Constr. Br. (Dkt. No. 1700) at 8. Neither the claims nor the specification of the patents-in-suit define “abstract” sufficiently for one of ordinary skill in the art to understand how to produce an abstract. The patents-in-suit mention data reduction based on perceptual models from compression schemes in combination with “Linear predictive coding (LPC), z-transform analysis, root mean square (rms), signal to peak.” ’472 patent at 4:14–16. However, no mathematical equations, nor programs, nor algorithm flow charts, nor diagrams are provided to explain to one of ordinary skill in the art how to adapt and combine such techniques, including cognitive identification, to produce abstracts that would permit successful comparison of signals to determine matches.

40. Successful comparison of signals to determine matches is a complex process, requiring skill in numerous disciplines, including signal processing mathematics, electrical engineering, computer science, music theory, physics, and perception (biology and psychology of hearing and seeing). Without a more complete design, extra-ordinary skill in the art would be required to adapt and combine these disciplines to produce effective abstract signals for correctly identifying and efficiently comparing signals to determine matches.

41. Without a complete description, mathematical equations, diagrams, or algorithm flow charts, one of ordinary skill in the art would be unable to produce the abstract mentioned in these four patents. As presented in these four patents, the term “abstract” would have been vague and indefinite to one of ordinary skill in the art at the time.

42. In my opinion, because the specification of the patents-in-suit does not define or provide sufficient means for one of ordinary skill in the art at the time to produce or interpret an

effective abstract, and because implementation of each claim is dependent on the term “abstract,” all asserted claims of the patents-in-suit are indefinite.

“similar to”

43. The term “similar to” appears in claims 8, 11, and 17 of the ’175 patent. All three claims use the term in the same limitation: “A system, comprising: . . . at least one processor; wherein said at least one processor is programmed or structured to generate a digital reference signal abstract from a digital reference signal such that said digital reference signal abstract is **similar to** said digital reference signal and reduced in size compared to said digital reference signal.” *See, e.g.*, ’175 patent claim 11, *see also id.* claims 8, 17.

44. The specification does not use “similar to” in the context of what makes a digital signal abstract similar to a reference signal. Its only use of the term is in describing how a psychoacoustic model is similar to a psychovisual model. ’175 patent at 14:41–42 (“Similar to the goals of a psychoacoustic model, a psychovisual model attempts to represent a visual image . . .”). The specification provides no guidance on how a digital signal abstract is similar to a digital reference signal.

45. “Similarity” is a subjective and vague concept. For software to identify and compare sounds, similarity must be algorithmically defined and mathematically quantified.

46. However, “similar” is not a word with an exact meaning in the art. One of ordinary skill in the art would understand from the four patents-in-suit that the signals must be perceptually similar.

47. However, to determine whether two signals are similar, the four patents-in-suit do not specify how many or which components of perception (e.g., recording hall acoustics, rhythm, tempo and the duration, pitch, loudness and timbre of each note) must match, and do not specify

quantitatively how similar these components must be. The four patents-in-suit do not specify how one would separate notes played on multiple instruments at the same time to detect a score, played by which instruments, and sung by different singers. Different recordings can include similar loudness, tempo, rhythms, tone colors (timbre of instruments and voices), pitches, and recording hall acoustics (particularly if they were recorded in the same hall). However, the score identifies the piece of music, including rhythms and note pitches; while the timbre aids identification of instruments and voices (e.g., recordings of the same score performed by different musicians). The tempo, tone colors (instrumental and vocal timbre) and recording hall acoustics help to narrow performances of that score to a particular recording.

48. Extraction of at least fragments of a score, or its equivalent, from the recording is fundamental to comparing the similarity of pitches and timbre of instruments and voices in a recording. Traditional analysis can yield frequencies of some notes, but the same pitch may be played at different frequencies, and has been over the centuries.⁸ Musical intervals,⁹ specifically

⁸ The musical note A above middle C is the standard used to tune Western music instruments. The tuning of A was standardized in the twentieth century to 440 cycles per second in the USA and United Kingdom, 440 to 444 Hz in Western Europe. However, instruments with fixed tunings, like church organs, have been designed over the centuries with A tuned to 377 Hz up to 567 Hz over the centuries. Partially because of the limited tuning range of some baroque instruments, the modern baroque pitch of A is 415 Hz. Rather than naively assume a tuning standard, analysis software must adapt to the tuning used by the recorded musicians.

⁹ Recognition of intervals like the octave, perfect fifth, major and minor thirds, and flatted sevenths (to play jazz in tune with the overtones of trumpets and trombones), are a critical part of identification and perceptual comparison of pieces of music. The intervals from Balinese and Javanese gamelans, Makam from North Africa, the Middle East and Eastern Europe and Indian raga (e.g., Komal Ga, Komal Ni, and Tivra Ma relative to the tonic) involve a sophisticated relationship between notes, some of which are tuned differently from traditional western tuning. Because contemporary music has adopted some of the music from these parts of the world, software which compares the perceptual similarity between recordings must take into account the intervals of music from different parts of the world to create scores from the recordings.

the relationship between frequencies of notes played by different instruments is much more critical in determining perceptual similarity and the score than absolute frequencies.

49. To extract the notes or score from the signal of a recording, the signals from different instruments, often played at the same time, must be separated into the notes for each instrument. The signal from a recording of a choir, piano and orchestra is composed of thousands of frequency components. Most commercial recordings are of multiple musicians playing at the same time, as compared to recordings of solo performers. The signal processing mathematics are extraordinarily challenging to successfully perform this task when many notes are played at the same time by instruments with similar spectral envelopes. In such recordings, one of ordinary skill in the art would not know how to analyze the signal to successfully separate the instrumental notes into a score. If one of ordinary skill in the art cannot create the equivalent of a score from signal analysis, one cannot determine whether two different signals are recordings of similar music performed by different musicians. Because the software, flow charts of algorithms, and signal processing mathematical analysis of signals are missing in the four patents-in-suit, one of ordinary skill in the art would have to invent the idea and design this invention.

50. Similar could mean perceptually similar voices, i.e., voices with similar spectral envelopes. To compare voices in recordings, the individual voices would have to be separated from the other instruments and voices in the recordings. This requires the challenging task of separation of notes from different instruments described above. Because neither the software, nor signal processing equations, nor algorithm flow charts is provided for this in the four patents-in-suit, one of ordinary skill in the art would not know how to compare signals to determine whether voices are similar.

51. Because software, mathematical equations, algorithm flow charts, schematics, and block diagrams for describing the means of comparing the similarity of signals are missing, the four patents-in-suit are vague and indefinite in defining “similar to.”

52. The term “similar to,” absent any guidance that informs one of ordinary skill how to understand the term, renders claims 8, 11, and 17 of the ’175 patent indefinite.

“index of relatedness”

53. The term “index of relatedness” appears only in claim 11 of the ’472 patent.

Claim 11 claims:

A computerized system for monitoring and analyzing at least one signal:

. . . .

a comparing device, coupled to said reference database and to said second input, that compares an abstract of said at least one query signal to the abstracts stored in the reference database to determine if the abstract of said at least one query signal matches any of the stored abstracts, Wherein the comparing device identifies at least two abstracts in the reference database that match the abstract of said at least one query signal and an **index of relatedness** to said at least one query signal for each of said at least two matching abstracts.

54. The term “index of relatedness” does not appear anywhere in the common specification of the patents-in-suit, or anywhere in the ’472 patent other than within Claim 11 of the ’472 patent. The specification thus provides no guidance on what “index of relatedness” means in the context of the ’472 patent.

55. As used in the ’472 patent, the term “index of relatedness” would have been vague and indefinite to one of ordinary skill in the art as of September, 2000. To the extent that “index of relatedness” could be a table or other data structure, the specification does not disclose what that structure is. The patents-in-suit have no figures, no algorithms, no mathematical

equations and contain no visual depiction of any table of other data structures. I found nothing in the patent specification that helped me determine how an “index of relatedness” works or how it would be produced.

56. Further, the specification of the patents-in-suit does not disclose how much “relatedness” it would take to determine if the two abstracts are “related.” Claim 11 of the ’472 patent calls for the selection of “at least” two matching abstracts to the reference signal abstract and the determination of an “index of relatedness.” Yet it does not disclose how “related” the two matching abstracts need to be, and fails to provide the algorithms or mathematical equations used to compare them. The specification does not provide an objective standard for determining “relatedness.”

57. While “index of relatedness” does not have a specific meaning in the art, one of ordinary skill in the art might assume that the index of relatedness would provide an undefined measure of similarity between a query signal [abstract] and at least two potentially matching abstracts of reference signals. However, one of ordinary skill in the art would not know exactly what an abstract was, and would not know how to produce an abstract or an index of relatedness, because the terms are indefinite and undefined in the ’472 patent.

58. The patents do not specify how the results of signal processing algorithms would be weighted and combined to quantitatively measure similarity between signal abstracts. Because the mathematics and algorithms for signal processing are not presented, one of ordinary skill in the art would not know which signal processing algorithms to use, and how to adapt them for this application.

59. Comparison of music signals based on signal processing mathematics to correctly identify, relate and successfully match signals without analysis of the musical score (or its

equivalent) is limited to piracy prevention of only simple music (e.g., solo monophonic music). In pitch class theory, an index of relatedness has been used in the context of music analysis.¹⁰ However, these four patents offer no evidence of understanding the composition level of music theory, and fail to suggest analysis of harmonic tension based on intervallic structure to provide an index of relatedness. If the patent inventors intended to use music theory, they should have provided the software or algorithms for musical score analysis. If music theory contributed to their intended means of identifying and comparing music and the meaning of an “index of relatedness” and if it was assumed that one of ordinary skill in the art is not expected to have a sufficient background in music theory to analyze different types of scores (including analysis of representations of music from non-western cultures), to provide this index of relatedness, the four patents-in-suit needed to provide a means of producing this index of relatedness.

60. Furthermore, the score must be extracted from the signal to enable music theory analysis of the composition. As described above, the four patents-in-suit fail to provide a means of extracting the score from the signal. Because these four patents provided no quantitative means of producing an index of relatedness, the term would have been vague and indefinite to one of ordinary skill in the art in September, 2000.

61. There is no clear, objective standard for determining when two or more abstracts are related. Nor is there a clear, objective standard for determining how “related” two abstracts have to be to satisfy claim 11’s requirement that the system determine “an index of relatedness . . . for each of said at least two matching abstracts.” ’472 patent, claim 11.

¹⁰ Schuijjer, Michiel, *Atonal Music: Pitch-class Set Theory and Its Contexts*, University Rochester Press, 2008.

62. Because the specification does not provide a clear, objective standard that would inform a person of ordinary skill of what an “index of relatedness” is and how to produce it for this application, and because the term lacks a standard meaning that would guide or instruct one of ordinary skill in the art, claim 11 of the ’472 patent fails to inform, with reasonable certainty, one skilled in the art about the scope of the invention and is indefinite.

“data describing a portion of the characteristics of its associated reference signal”

63. The claim term “data describing a portion of the characteristics of its associated reference signal” appears in claim 7 of the ’700 patent and claim 17 of the ’494 patent.

64. Claim 7 of the ’700 patent reads: “The system of claim 1, wherein the stored abstracts comprise data describing a portion of the characteristics of its associated reference signal.” Claim 17 of the ’494 patent reads: “The system of claim 11, wherein at least one abstract comprises data describing a portion of the characteristics of its associated reference signal.”

65. The specification does not provide any guidance on what “portion” refers to. It gives no examples of what constitutes a “portion” in the context of characteristics of a reference signal. It uses “portion” only to discuss the portion of a signal being monitored in which the signal being monitored may be thought of comprising a set of objects. *See* ’494 patent at 8:34–38.

66. Nor does the specification define “characteristics,” and how one of ordinary skill could segment out a “portion” of those characteristics. “The signal identifier/ detector should receive its parameters from a database engine. The engine will identify those characteristics (for example, the differences) that can be used to distinguish one digital signal from all other digital signals that are stored in its collection.” ’494 patent at 10:20–24.

67. Neither “portion” nor “characteristics” has a technical meaning in the field.

68. Because the term “data describing a portion of the characteristics of its associated reference signal” is vague and does not inform one of ordinary skill with reasonable certainty about the scope of the invention, claims 7 of the ’700 patent and 17 of the ’494 patent are indefinite.

“programmed or structured to use an/said algorithm . . .”

69. The claim term “programmed or structured to use an/said algorithm to generate said digital reference/query signal abstract from said digital reference/query signal” appears in claim 16 of the ’175 patent.

70. Claim 16 of the ’175 patent reads:

The system of claim 12, wherein said at least one processor is programmed or structured to use an algorithm to generate said digital reference signal abstract from said digital reference signal; and wherein said at least one processor is programmed or structured to use said algorithm to generate said digital query signal abstract from said digital query signal.

71. I have studied the common specification of the ’175 patent and found no disclosure of an “algorithm” that a processor could use to generate a query signal or reference signal. It mentions algorithms only fleetingly: “Those skilled in the art of algorithmic information theory (AIT) can recognize that it is now possible to describe optimized use of binary data for content and functionality.” ’175 patent at 14:20–23. “To the extent that objects can have an optimized data size when compared with other objects for any given set of objects, the algorithms for data reduction would have predetermined flexibility directly related to computational efficiency and the set of objects to be monitored.” *Id.* at 14:26–31.

72. As there are numerous algorithms for analysis and comparison, one of ordinary skill in the art would not know which algorithms to program or structure to generate the digital reference abstract from a reference signal, or to generate a query signal abstract from a query signal. Although the names of some tools are mentioned, the patents do not provide the software, algorithms or mathematics one of ordinary skill in the art would need to understand how to analyze media and generate data to identify and compare media for copyright protection from piracy.

73. As mathematical signal processing algorithms yield different results than statistical algorithms or high-level structural analysis (e.g., analysis of the structure of a score based on music theory), one of ordinary skill in the art would not know which specific algorithms to use with each type of media, how to adapt signal processing and statistical mathematics for each type of media, which algorithms to combine, in which order to combine these tools, and what type of database structure to program for sorting the results for efficient searches through content characterizations of the wide variety of audio recordings, video recordings, and photographs. Different results are produced by each of these decisions. One of ordinary skill in the art would not know how to design and train algorithms, because the patents do not include the algorithms and provide insufficient detail, for example, in interactive characterization of the numerous sets of media examples for each type of media, required to statistically sort results. Algorithms which are trained differently produce a different sorting of results.

74. Classical mathematical techniques often produce erroneous data when analyzing time-varying signals like those in music. The patents do not provide the algorithms and mathematics needed by one of ordinary skill in the art to understand how to successfully track

individual instruments and voices for extraction of the frequencies, durations and spectra of notes to identify fragments of a score. For example, the patents do not describe how to compare differences in timing of attacks of spectral shapes, and the relationships of harmonic and inharmonic overtones, to determine which *physical* parameters (e.g., frequencies, amplitudes, durations and spectra) are associated with which *perceptual* characteristics (e.g., notes). Different signal processing algorithms produce different results, and different results are produced by the same algorithm when set with different parameters. This is but one example of the lack of information in the patents needed by one of ordinary skill in the art to generate abstracts for *perceptual* identification of media from the physical content, and from the *physical data* of signal processing analysis.

75. Without extensive experimentation, one of ordinary skill in the art would not know which mathematical signal processing algorithms to use and how to adapt these mathematical tools for different content (pop music singing, Western symphony, African drumming, etc.) by modifying the mathematics, setting parameters, and adding filters and further processing to generate abstracts, because the patents do not disclose these descriptions needed for successful identification. For example, different signal processing windows and different amounts of window overlap yield different results. Without extensive experimentation with a wide variety of media content, one of ordinary skill in the art would not know which type of mathematical windowing to apply and how much overlap is required. Without extensive experimentation, one of ordinary skill in the art would also not know which statistical techniques to use to filter and process intermediate results in generating signal abstracts from signals, and how to combine statistical techniques to sort signal abstracts for comparison of media. Different statistical techniques yield different results. One of ordinary skill in the art would not know how

to structure a large database of the vast amount of recorded media for efficient searches, as the database structure was not disclosed in the patents. Different structures yield different results, and different results are produced by the same algorithm when configured with different parameters.

76. Considering the absence of such disclosures, a person of ordinary skill in the art reading the patent would not know which algorithm is needed to generate an abstract. Software, algorithm flow charts, mathematical equations, block diagrams and guidance are needed for each step of analysis, for each type of media. Naming of techniques alone, does not provide one of ordinary skill in the art with sufficient information to successfully identify and compare signals for copyright protection of media piracy. Because the patents are vague, abstract and indefinite, one of ordinary skill in the art would need to perform extensive experimentation to determine: i. useful algorithms, ii. how to successfully adapt the algorithms for each type of media, and iii. the order in which combined algorithms should be applied.

77. In my opinion, because the term “programmed or structured to use an algorithm to generate said digital reference/query signal abstract from said digital reference/query signal,” read in light of the specification, is vague and does not inform one of ordinary skill with reasonable certainty how to generate a reference or query signal abstract using an algorithm, claim 16 of the ’175 patent is indefinite.

Date: __9 Sept., 2014_____

Respectfully submitted,

A handwritten signature in black ink, appearing to read "John H. [unclear]", written over a horizontal line.